

Statement of Work

I. Title: APEX/HAPEM Recoding
Contractor Name: ICF
Contract #: EP-W-12-010
WA #: 4-60
Period of Performance: Upon Contracting Officer Approval – March 28, 2020

II. Work Assignment Manager (WAM):

John Langstaff
U.S. Environmental Protection Agency
OAQPS, HEID (C539-07)
RTP, NC 27711
(919) 541-1449

Alternate WAM:

Stephen Graham
U.S. Environmental Protection Agency
OAQPS, HEID (C539-07)
RTP, NC 27711
(919) 541-4344

III. Background:

The U.S. Environmental Protection Agency (EPA) developed the Air Pollutant Exposure Model (APEX) for use in regulatory and other applications. APEX serves as the inhalation exposure model for the Total Risk Integrated Methodology (TRIM) system developed by the Office of Air Quality Planning and Standards (OAQPS) with assistance from the National Exposure Research Laboratory (NERL).

According to several metrics, EPA's APEX by definition may be obsolete software. While the science contained within the model has been continuously updated, the metrics of obsolescence are related to age, composition, ease of maintenance, and usability. It is critical for EPA to redevelop the APEX model using a modern computer programming language and with modern features for developers and users. This will ensure that APEX remains a state-of-the-science regulatory model for years to come (e.g., supporting National Ambient Air Quality Standards (NAAQS) risk and exposure assessments), while increasing its use by individuals outside the agency.

A newly envisioned model employing a more modern programming language would make better use of current technological advancements in computing. These currently available technological advancements would better optimize many of the complex functions performed by the model, making the programming code more transparent, simpler, and easier to modify, and potentially making the functions run faster—qualities all of which would better reflect EPA's open source

software policies and goals. It would allow independent users to more easily test parts of the model and use the model in customized ways to meet their own project needs. There would be no need for a compiler by any model developers, currently a limitation to the existing programming code, to test changes or run the model. Following current concepts of modular software design also would simplify updates and additions to the model over time. Then, new procedures could be placed into the workflow with more reliability, also facilitating the development of data pre-processors, model interfaces, post-processors, graphics production, etc., that would help broaden the model's user group through these user-friendly components. Finally, all of these aspects also would improve EPA's capabilities to efficiently update the model, more easily set up and run exposure scenarios, and better synthesize their results for regulatory applications such as NAAQS risk and exposure assessments.

The purpose of this work assignment (WA) is to recode the APEX model in R (or Python - to be decided). This will enable EPA to make available the best available technology for modeling population inhalation exposure to air pollutants. The EPA WAM is authorized to provide technical direction in accordance with the contract. This statement of work (SOW) indicates tasks the Contractor shall perform which are described below.

IV. Description and Tasks:

Task 1. Initial Meeting and Work Plan

Within two weeks after WA approval, a phone conference shall be arranged and conducted by the Contractor to discuss the initiation of the tasks with the EPA WAM and clarify any questions regarding preparation of work plan. Subsequently, phone conferences shall be scheduled and conducted by the Contractor on an as needed basis to discuss with the EPA WAM the progress and any issues associated with the tasks.

Within 20 days of the effective date of this WA, the Contractor shall submit a work plan describing the schedule for the WA completion and an estimate of the cost for completing the work. Following review of the work plan by the EPA WAM, the Contractor shall modify the work plan to reflect comments and recommendations by the WAM (if any exist). This final work plan, if modified, shall be submitted by the Contractor in accordance with the terms of the contract.

Deliverables:

- 1.a. Initial phone conference
- 1.b. Work Plan

Task 2. Recoding APEX, Phase 1

The Contractor shall prepare and deliver to EPA WAM a flow chart of APEX that emphasizes key model modules, components, and algorithms. Delivery of this flow chart shall be no later than three weeks after the initial meeting in Task 1. One week after submission of the flow chart, the Contractor shall meet with EPA WAM to discuss and prioritize which parts of APEX shall be recoded under Phase 1 of this effort (through March 28, 2020). The WAM will provide technical direction to the Contractor within one week of the meeting, and following receipt of technical direction, the Contractor shall recode the selected modules, components, and

algorithms of the APEX model in the selected language, test and debug the new code, optimize the code for the purpose of calculation efficiency, and report on the differences (if any exist) between the new version and the existing Fortran version. The Contractor shall prepare and submit a draft memorandum describing the new version and the results of the comparison no later than March 28, 2020.

Deliverables:

- 2.a. Flow chart of APEX used for identifying/prioritizing Phase 1 recoding.
- 2.b. Meeting to discuss APEX recode prioritization.
- 2.c. After TD from WAM, recode, test/debug, optimize code, and report differences.
- 2.d. Preparation/delivery of draft memo to EPA WAM describing progress to date, source code and example input and output files.

V. QA Requirements:

Quality assurance activities shall be conducted to assure environmental data generated, processed or used to support any computer coding shall be of known quality and shall achieve prescribed data quality objectives. Furthermore, the data shall be adequate and sufficient for their intended use. The Contractor shall be in compliance with the requirements of CIO 2105.0, Policy and Program Requirements for the Mandatory Agency Wide Quality System and the American National Standard-Specifications and Guidelines for Environmental Data Collection and Environmental Technology Programs (ANSI/ASQC-E4-2014). Consistent with these requirements, the Contractor shall develop a Quality Assurance Project Plan.

A. Quality Assurance Project Plans (QAPP). The Contractor shall develop a QAPP to provide a plan for obtaining, using, storing, and retrieving the type and quality of environmental data needed for EPA's risk and exposure assessment modeling, analyses and model modification activities described in this SOW. The QAPP should document how quality assurance (QA) and quality control (QC) activities are applied to environmental data operations to assure that the results obtained are of the type and quality needed and expected.

1. The Contractor shall submit a draft QAPP in Microsoft Word format, divided by sections that describe the policies, organization, objectives, functional guidelines, and specific QA/QC activities designed to achieve the data quality requirements of the statement of work. The QAPP shall provide a level of detail and organization that is consistent with EPA QA/R-5, *EPA Requirements for Quality Assurance Project Plans* which can found at <https://www.epa.gov/quality/epa-qar-5-epa-requirements-quality-assurance-project-plans>. An example *Template for Developing a Generic (or project-specific) Quality Assurance Project Plan (or plan elements) For Model Development, Modification, Evaluation and Application* can be found at <https://www.epa.gov/quality/template-developing-generic-quality-assurance-project-plan-or-plan-elements-model>. The Contractor shall include all tasks or implementable measures that are necessary to optimize the quality or assess the uncertainty of the data that is produced. Additional guidance on developing the QAPP is available in EPA's *Guidance for Quality Assurance Project Plans for Modeling EPA QA/G-5M*

which can be found at <https://www.epa.gov/quality/guidance-quality-assurance-project-plans-modeling-epa-qag-5m>.

2. Upon receipt of the draft QAPP, EPA will provide comments on the submitted draft QAPP in writing or directly on a digital file. The Contractor shall revise the QAPP and resubmit it to the EPA for approval within 20 calendar days. The revised QAPP will be the official QAPP for this statement of work.
3. QAPP Amendments – During the term of the contract, the Contractor shall revise and maintain on file, with all previous revisions, an amended QAPP within 30 days of the following circumstances:
 - a. The Agency modifies the contract.
 - b. The Agency notifies the Contractor of deficiencies in the QAPP document resulting from the Agency's review of the Contractor's performance.
 - c. The Contractor identifies deficiencies resulting from their internal review of the QAPP document.
 - d. The Contractor's organization, personnel, facility, equipment, policies, or procedures change.
 - e. The Contractor identifies deficiencies resulting from the internal review of their organization personnel, facility, equipment, policies or procedures.
4. Document Control - When the QAPP or any SOP is amended, all changes shall be clearly marked with a bar in the margin indicating where the change is found in the document, or by highlighting the change by underlining, bold printing, or using a different print font. The amended section pages shall have the date on which the changes were implemented. Any changes in the QAPP shall be submitted to the EPA Project Officer for approval before implementation.
5. QAPP and SOP Archival - The Contractor shall maintain a master QAPP which incorporates the original QAPP and all subsequent amendments. The Contractor shall provide a copy of the master QAPP (including the SOPs) and any of its attachments to the designated recipients within 14 days of a request.

Deliverables:

- V.a. Complete and deliver draft QAPP to EPA WAM.
- V.b. After EPA review/comments received, deliver to EPA revised QAPP within 20 days.
- V.c. Amendments, if needed, as noted in V.3, above.

VI. Deliverables:

The Contractor shall adhere to the following schedule:

TASK	DELIVERABLES	DELIVERY SCHEDULE
1.a.	Initial phone conference	Within 2 weeks of approved WA
1.b.	Work Plan	20 Days after approved WA
2.a.	Flow chart of APEX	Three weeks after initial phone conference.

2.b.	Meeting to discuss APEX recode prioritization	1 week after flow chart delivery
2.c.	Recode, test/debug, optimize code, and report differences	After EPA WAM Technical Direction, ongoing through March 28, 2020*
2.d.	Preparation/delivery of draft memo to EPA WAM describing progress to date, source code and example input and output files.	N/I/t March 28, 2020*
V.a.	QAPP Draft	4 weeks after WA approval
V.b.	Revised QAPP	20 days after EPA review
V.c.	Amendments, if needed	Schedule as noted in V.3. above.
VII.a.	Monthly progress reports	According to contract terms
VII.b.	Updated code and documentation of modification to APEX model.	N/I/t March 28, 2020*

**In the event contract is extended, dates will be reviewed by EPA WAM and revisions may be made to schedule through technical direction.*

VII. Reporting Requirements:

The Contractor shall provide monthly progress reports in accordance with the terms of the contract. The Contractor shall provide all reports requested in the SOW. The Contractor shall deliver to the EPA WAM updated code and documentation of modifications to the APEX model. The Contractor shall submit work products in electronic form: reports and memoranda in Microsoft Word, and data sets in text, Microsoft Access, or SAS format.

Deliverables:

VII.a. Monthly progress reports

VII.b. Updated code and documentation of modification to APEX model.